IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	MITCHELL et al.	Examiner:	Wu, J.
Serial No.:	09/694,455	Group Art Unit:	2623
Filed:	October 23, 2000	Docket No.	**BLD920000064US1** (IBMN.024US01)
Title:	FASTER TRANSFORMS USING EARLY ABORTS AND PRECISION REFINEMENTS		

CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence and the papers, as described hereinabove, are being deposited in the United States Postal Service, as first class mail, in an envelope addressed to: Board of Patent Appeals and Interferences, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450, on January 26, 2005.

By: Bridget Hayden

APPEAL BRIEF

Board of Patent Appeals and Interferences
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This is an Appeal Brief submitted pursuant to 37 C.F.R. § 41.37 for the above-referenced patent application. Please charge Deposit Account No. 50-0563 (BLD920000064US1) in the amount of $500.00 for this brief in support of appeal as indicated in 37 C.F.R. § 41.20(b)(2). If necessary, authority is given to charge/credit deposit account 50-0996 (IBMN.024US01) any additional fees/overages in support of this filing.

I. Real Party in Interest

The real party in interest is International Business Machines Corporation, having a place of business at New Orchard Road, Armonk, New York 10504. This application is assigned to International Business Machines Corporation.

II. Related Appeals and Interferences

Appellants are unaware of any related appeals, interferences or judicial proceedings.

III. Status of Claims

Claims 17-20, 22, 27, and 33 are rejected. Claims 21, 23-26, 28-32 are objected to. Claims 17-33 are presented for appeal and may be found in the attached Appendix of Appealed Claims in their present form. Claims 1-16 and 34-81 were withdrawn previously.

IV. Status of Amendments

No amendments to the claims were made subsequent to the final rejection of Appellants' application.

V. Summary of Invention

A data compression system is provided. The data compression system includes a transformer for applying a linear analysis transform to decorrelate data into transform coefficients using transform equations, the transformer reducing errors of the transform by testing at least one number resulting from an incremental calculation of transform coefficients during a transform, determining whether to perform a corrective action based upon the testing and performing the corrective action when a corrective action is determined to be needed.

Support for the subject matter of Appellants' invention can be found at least in the specification at figs. 10 and 11 and the corresponding portions of the specification.

VI. Grounds of Rejection

Appellant has attempted to comply with new rule 37 C.F.R. § 41.37(c) by providing the Office Action's grounds of rejection verbatim, followed by an argument section corresponding thereto.

A. Claims 17-19, 27, and 33 are rejected under 35 U.S.C. § 102(b) over "Vector set partitioning with classified successive refinement VQ for embedded wavelet image coding" to Mukherjee et al.

B. Claims 20 and 22 are rejected under 35 U.S.C. § 103(a) over Mukherjee et al. in further view of Reuman (U.S. Patent No. 5,629,778).

VII. Argument

A. CLAIMS 17-19, 27, AND 33 ARE PATENTABLE OVER MUKHERJEE.

1. Mukherjee fails to disclose, teach or suggest "testing at least one number resulting from an incremental calculation of transform coefficients during a transform."

Mukherjee discloses a method of performing vector set partitioning that is involved in quantization issue (see, page IV-25, first column, first paragraph of the Introduction). Mukherjee provides a method of ordering of coefficients for quantization (see, page IV-26, first column, first full paragraph). Mukherjee merely sets the order of vectors according to their vector magnitudes. The method involves using multiple passes to order the vectors according to their vector magnitudes by identifying vectors higher than a threshold that is used for a pass. Each pass ascertains the set of vectors that are bounded by the present threshold and the previous threshold. Vectors having a vector magnitude identified in a pass are deemed significant and the significant vectors for a pass are quantized. Previously identified significant vectors are further refined by successive quantization. The quantization of all vectors is completed using multiple passes.

Accordingly, Mukherjee fails to perform an incremental calculation of transform coefficients that is tested to reduce errors of the transform. Sorting vectors according to their vector magnitude is not the same as testing an incremental calculation of transform coefficients to reduce errors of the transform. In fact, the quantization of Mukherjee is not tested in any way. The "comparing" performed by Mukherjee involves comparing coefficients to a threshold. However, such a comparison cannot identify when the quantization provides unacceptable precision so that the quantization may be stopped mid-stream and a different quantization used.

Accordingly, Mukherjee fails to teach, disclose or suggest testing at least one number resulting from an incremental calculation of transform coefficients during a transform.

2. Mukherjee fails to disclose, teach or suggest "determining whether to take corrective action."

Mukherjee fails to suggest any type of corrective action in response to testing an incremental calculation of transform coefficients. Mukherjee cannot do so because Mukherjee fails to test an incremental calculation of transform coefficients.

While Mukherjee does recognize that too many bits may be used in quantizing insignificant vectors, Mukherjee does not suggest that a determination is made whether to perform quantization for such bits. Rather, Mukherjee merely admits that vector quantization cannot be expected to be very effective.

Accordingly, Mukherjee fails to suggest "determining whether to take corrective action."

3. Mukherjee fails to disclose, teach or suggest "performing the corrective action when a correct action is determined to be needed."

Mukherjee fails to suggest determining whether to take any type of corrective action as described above. Nevertheless, the "corrective action" cited in the Final Office action, on page 3, is the thresholding procedure for each pass in which each pass ascertains as significant the set of vectors that lie within an HV-dimensional shell.

Appellant respectfully submits that the thresholding procedure of Mukherjee is merely a method of ordering vectors according to their vector magnitudes. The contribution of Mukherjee is recognizing that higher magnitude vector, when transmitted losslessly, will reduce the reconstruction mean-squared error more than a lower magnitude coefficient, and therefore should be quantized before lower magnitude vectors. Nevertheless, the thresholding method does not reduce errors by performing correcting action based on the testing of an incremental calculation of transform coefficients.

Further, the Office Action asserts that vectors that have magnitudes lower than the threshold in the pass will be thesholded to zero. However, Mukherjee fails to suggest that vectors are zeroes. Rather, Mukherjee states that insignificant vectors will be quantized using too many bits and cannot be expected to be very effective.

B. CLAIMS 20 AND 22 ARE PATENTABLE OVER MUKHERJEE IN VIEW OF REUMAN.

1. Reuman fails to overcome the deficiencies of Mukherjee.

Reuman is merely cited as disclosing a refinement matrix to reduce the block effects of transform coding. According to Reuman, encoded data is converted into received image data terms, which are subsequently overlap transformed into frequency coefficients for modification by means of a filtering operation utilizing a quantization error matrix. Reuman fails to disclose, teach of suggest reducing errors of the transform by testing at least one number resulting from an incremental calculation of transform coefficients during a transform, determining whether to perform a corrective action based upon the testing and performing the corrective action when a corrective action is determined to be needed.

Moreover, Reuman fails to suggest refining a number by applying a refinement matrix for increasing precision of the incremental calculation of the transform constants. Reuman does not even mention performing an incremental calculation of transform coefficients during a transform.

Accordingly, claims 20 and 22 are patentable over Mukherjee in view of Reuman.

2. No evidence has been provided to combine the cited references.

The Office Actions do not provide evidence of a motivation for modifying Mukherjee with the teachings of Reuman, and therefore, the combination is improper. The Office Action alleges that the combination is obvious because the combination would "compensate the error of transform coding (Reuman, col. 3)."

The alleged motivation is improper because it is unsupported by any evidence and is therefore, conclusory. This alleged motivation is merely a broad, conclusory statement of a perceived benefit. The alleged motivation lacks clear and particular reasons that would lead one of ordinary skill in the art to modify specific teachings of Mukherjee with specific teachings of Reuman. For example, the Office Actions provide no evidence that Mukherjee is deficient in "transform coding" as compared to the combination, nor do the Office Actions provide evidence as to the specific elements of Mukherjee that could be modified by specific elements of Reuman to yield Appellants' data compression system. Furthermore, the

reference to (Reuman col. 3) merely points to the Summary of the Invention of Reuman, and not to specific elements of Reuman to combine with Mukherjee.

The alleged reasons are also insufficient because the Office Action does not demonstrate that Mukherjee has any need to "compensate the error of transform coding." Furthermore, there is no evidence provided to indicate how the teachings of Reuman would "compensate the error of transform coding."

The alleged motivation is improper and therefore, does not support prima facie obviousness. Therefore, the rejection of claims 20 and 22 should be withdrawn.

3. The proposed combination has no apparent reasonable expectation of success.

The alleged motivation, to the extent it is understood, ignores the fact that Mukherjee and Reuman appear to address different problems. Reuman appears to be directed towards "an image encoding/decoding apparatus for performing transform coding by a method in which blocking artifacts are suppressed or eliminated," (see the Summary of the Invention) while Mukherjee appears to be directed to improving a wavelet-based still image compression scheme using a vector-based approach (see Abstract). There is no evidence provided to indicate the vector-based approach to SPIHT of Mukherjee would be amenable to modification using Reuman's digital image deconstruction/reconstruction method using suppressed blocking artifacts. Thus, the different problem areas addressed by Mukherjee and Reuman appear to weigh against a reasonable expectation of successfully combining the generally referenced teachings.

The alleged motivation is merely a broad conclusory statement of a benefit that is speculative, and no evidence has been provided that suggests the combination. The rejection fails to show that the limitations of the claims are suggested by the combination, fails to provide a proper motivation for making the combination, and fails to show a reasonable expectation of successfully making the combination. Therefore, the Office Actions do not establish a prima facie case of obviousness for claims 20 and 22 over Mukherjee in view of Reuman.

4. Mukherjee and Mukherjee in view of Reuman fails to disclose, teach or suggest the elements of the dependent claims.

Dependent claims 18-20, 22, 27, and 33, are also patentable over the references, because they incorporate all of the limitations of the corresponding independent claim 17. Further, dependent claims 18-20, 22, 27, and 33 recite additional novel elements and limitations. Because claims 18-20, 22, 27, and 33 depend from claim 17, and each of the claims include further features, Appellants assert that claims 18-20, 22, 27, and 33 are patentable over Mukherjee and Mukherjee in view of Reuman.

VIII. Conclusion

In view of the above, Appellants submit that the rejections are improper, the claimed invention is patentable, and that the rejections and objections of claims 17-33 should be reversed. Appellants respectfully request reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the assignee's deposit account was provided on the first page of this brief.

Respectfully submitted,

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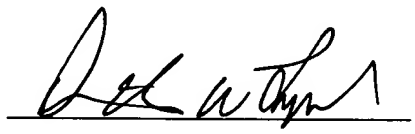
By: 
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APPENDIX OF APPEALED CLAIMS FOR APPLICATION NO. 09/694,455

17. (original) A data compression system, the data compression system comprising a transformer for applying a linear analysis transform to decorrelate data into transform coefficients using transform equations, the transformer reducing errors of the transform by testing at least one number resulting from an incremental calculation of transform coefficients during a transform, determining whether to perform a corrective action based upon the testing and performing the corrective action when a corrective action is determined to be needed.

18. (original) The data compression system of claim 17 further comprising a quantizer for quantizing the transformed data into quantized data to reduce a number of bits needed to represent the transform coefficients.

19. (original) The data compression system of claim 17 wherein the transformer determines whether to perform a corrective action by detecting whether the incremental calculation of the transform coefficients will result in transform coefficients with unacceptable precision and performs corrective action by refining the at least one number.

20. (original) The data compression system of claim 19 wherein the transform comprises a transform matrix and wherein the transformer refines the at least one number by applying a refinement matrix for increasing precision of the incremental calculation of the transform constants.

21. (original) The data compression system of claim 20 wherein the refinement matrix comprises $I+_d D_{m+1}\ D_m^{-1}$.

22. (original) The data compression system of claim 20 wherein the refinement matrix is based on approximately calculated transform constants.

23. (original) The data compression system of claim 22 wherein the refinement matrix is generated offline or at initialization.

24. (original) The data compression system of claim 21 wherein the refinement matrix is generated by recognizing that an approximate transform is invertible, generating the refinement matrix given by $I+_d D_{m+1}\ D_m^{-1}$, and structuring the transform for efficient computation.

25. (original) The data compression system of claim 21 wherein the refinement matrix is generated by recognizing that recovery of the nth column of a transform matrix for generating the transform is impossible, calculating a pseudo inverse for a portion of the transform matrix and generating an approximation for the refinement matrix using the pseudo inverse for the transform matrix.

26. The data compression system of claim 25 wherein the approximation of the refinement matrix comprises $I+_d D_{1d} \widetilde{D}_0$.

27. (original) The data compression system of claim 17 wherein the transformer determines whether to perform a corrective action by determining whether an error resulting from terminating the incremental calculation is acceptable and performs corrective action by aborting the incremental calculation of a transform coefficient.

28. (original) The data compression system of claim 27 wherein the transformer terminates the incremental calculation when a determination is made that the incremental calculation will result in a number that is projected to be within a predetermined range.

29. (original) The data compression system of claim 28 wherein the number that is projected to be within a predetermined range comprises a transform coefficient that does satisfy a precision requirement.

30. (original) The data compression system of claim 28 wherein the transformer terminates the incremental calculation when a refinement to the transform coefficient is determined not to change the result.

31. (original) The data compression system of claim 30 wherein the transformer determines that a refinement to the transform coefficient will not change the result when, after checking the relative magnitudes of the results of the incremental calculations, an intermediate calculation of at least one transform coefficient is small compared to the intermediate calculation of another transform coefficient.

32. (original) The data compression system of claim 30 wherein the transformer determines that a refinement to the transform coefficient will not change the result when, after checking the magnitude of the results of at least one incremental calculation, at least one intermediate calculation of the transform coefficient is less than a predetermined threshold.

33. (original) The data compression system of claim 17 wherein the transformer determines that a corrective action is to be determined by determining that a transform coefficient is going to be within a predetermined range of zero and performs corrective action by aborting the incremental calculation of the transform coefficient.

APPENDIX OF EVIDENCE FOR APPLICATION NO. 09/694,455

Appellants are unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

APPENDIX OF RELATED PROCEEDINGS FOR APPLICATION NO. 09/694,455

As stated in Section II above, Appellants are unaware of any related appeals, interferences or judicial proceedings.